Biology, Ecology, Management and Conservation of the Fisheries of

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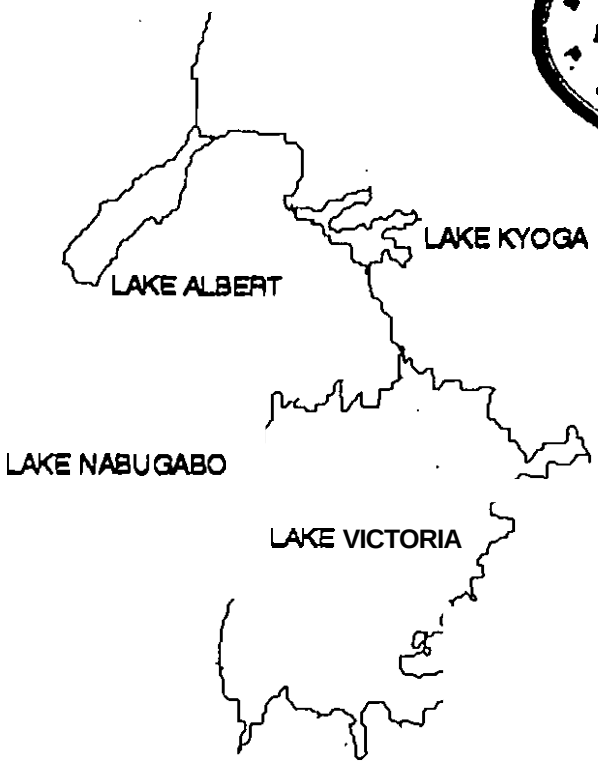
Technical Report



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CHAPTER VII

The Biology, Ecology, Distribution and Conservation of some Surviving Native Non-cichlid fish species of Lakes Victoria, Kyoga and Nabugabo.

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Introduction

Prior to introduction of non-native fish species into Lakes Victoria, Kyoga and Nabugabo, the three lakes supported diverse fish fauna representing 13 families consisting of six cichlid genera and fifteen non-cichlid genera. There were about 50 non-cichlid species and over 300 cichlids consisting of mainly haplochromines (Graham 1929, worthington 1929, Greenwood 1960). Many of the species were commercially and scientifically important and provided a rich variety of protein source to choose from. Following introduction of the Nile perch and several tilapiines species, most of the native species were drastically reduced and some have apparently disappeared. The few remaining species appear to be restricted in distribution due to the presence of the Nile perch. They are mainly confined to refugia such as marginal macrophytes, rocky outcrops and small satellite lakes which are separated from the areas of introduction by swamps.

The two introduced species; Nile perch and Nile tilapia which now dominate the commercial fishery are exported and less available for local consumption. Besides, the lakes to which the Nile perch and Nile tilapia were introduced are still in a transitional stage and it is feared that the Nile perch fishery may not sustain production. If the Nile perch fishery collapses, the indigenous fishery may recover and provide the much needed protein food. The conservation of any remnants of the native fish fauna is therefore very important not only as a source of fish protein but also to maintain biodiversity which is necessary in the overall environmental stability of the ecosytems.

One of the main objections to introduction of the Nile perch was that it would not only reduce fish species diversity by directly feeding on the fishes but that it would, through competition affect the native predators such as *Bagrus docmac* and *Clarias gariepinas* which also depended on haplochromines for food. This study shows how these native predators have been affected and how they have adapted to the changed conditions. Studies of *Rastrineobola argentea* which is the only native species that became abundant following introduction of the Nile perch and those of the surviving haplochromines are covered elsewhere. This study will concentrate on the endangered non-cichlid species.

Objectives

i. to establish an inventory of surviving non-cichlid species
ii. to determine the distribution of these species and the factors that affect the distribution
iii. to determine trophic relationships of these species With the introduced species especially Nile perch

iv. Examine their biological characteristics and compare this with available historical data
v. Recommend measures for conservation and management of the endangered species.

Hypothesis

The hypotheses examined in this study were that

i. the extant species escaped Nile perch predation by hiding among refugia and restricting their activities in these areas
ii. these species have been affected by competition with the introduced species for food and their food has changed.
iii. life history parameters of these species have changed due to the stress imposed upon them by being restricted in a small area.

study Areas, Materials and Methods

Data was collected from Lakes Victoria, Kyoga and Nabugabo Three small satellite lakes of Lake Nabugabo (Lakes Kayanja, Kayugi and Manywa) to which no Nile perch were introduced were also sampled. Samples were obtained by gill netting, beach seining, basket traps and by trawling (only in Victoria). The nets were set at selected stations which included areas near various types of macropyte cover, rocky out crops and open water.

The weight and number of fish caught at each station were recorded. The non-cichlid species were sorted out and biometric data recorded. This included length, weight, maturity state and stomach fullness. Stomachs with food were preserved in 5% formalin for analysis in the laboratory. Importance indices were calculated for each prey type in the different stomachs. Ripe gonads were also preserved in formalin for fecundity studies.

Results

This work started towards the end of the Nile Perch Project and the results given here should be regarded as preliminary observations.

The existing non-cichlid species

About 50 non-cichlid species occurred in Lakes Victoria, Kyoga and Nabugabo prior to introduction of non-native fishes. Of these 16 have so far been recovered most of them in very small numbers. Only eight of these were caught in sufficient quantities to be studied in some detail. These included; *Barbus altinalis, Synodontis afrofischeri, Bagrus docmac, Clarias gariepinus, Protpterus aethiopicus, Schilbe intermedius, Hormyrus kannumme and Brycinus jacksonii.* The original distribution and food of these fishes are compared with the current observations in Tables 1 and 2.

Barbus altianalis

Only *B. altianalis* was recovered from Lake Kyoga mainly near river Nile and inshore areas near swamp fringes (papyrus & water Hyacinth). This species was originally widely distributed in the lakes.

B. altianalis previously fed on insects, phytoplankton, molluscs and higher plant material. The present food of *B. altianalis* is similar to that reported by Corbet (1929). No *Barbus* sp. were recovered from L. Victoria. In lakes Nabugabo and Manywa one species, *B. kerstenii kerstenii, was recovered.*

Synodontis afro-fischeri

S. afrofischeri was recorded from all the three Lakes. In Lake Victoria it was obtained from trawl catches over a rocky bottom stretch in Napoleon Gulf. In Lake Nabugabo it was caught in macrophyte covered bays. This species which was previous common in bottom waters of Lake Victoria now seems to be confined to rocky outcrops.

About 50 specimen from Lake Nabugabo were examined for food. They had eaten insects (mainly chironomids and ephemeropterans), annelids, some ostracods and higher plant matter. 5 stomachs had fish remains and 2 had mud. There were no terrestrial insects and no sign of molluscs.

33 specimens from Lake Victoria which were examined for food had mainly ingested chironomid larvae & pupae and Ephemeropteran nymphs. There were some molluscs, but no plant remains, annelids or terrestrial insects.

Bagrus docmac

B. docmac were obtained from trawl catches over rocky areas in Napoleon Gulf, Salisbury, Rosebury and Buvuma channels. They were not encountered all from Lakes Kyoga and Nabugabo although previously abundant in these lakes. This species seems to be more abundant in the river Nile at present. Its distribution has changed due to the presence of the Nile perch.

41 individuals were examined for food. They had eaten mainly fish, anisoptera nymphs, chironomid larvae, gastropod molluscs and some *Caridina.* Fish prey are now dominated by *Rastrineobola* instead of Haplochromines which which used to be its main prey. This is because the haplochromines have been depleted by the Nile perch. *Caridina niloticus* was rare among the stomach contents suggesting that feeding does not take place in the open waters. The feeding habit has therefore changed a bit.

Clarias gariepinus

One specimen was obtained by experimental gillnetting from Lake Kyoga although the species appeared regularly in commercial catches. It also appeared regularly in the stomach contents of Nile perch caught on long lines it was suspected that it was being used as bait. Some fishermen interviewed revealed that the species were obtainable from rocky areas and papyrus swamps. 2 specimen were obtained from Lake Kayanja and one from Lake Kayugi. These lakes are surrounded by swamp and have emergent macrophytes. A few

specimens were obtained from a rocky area in Napoleon Gulf and some from the deep waters of Salisbury channel near Ssese Islands (30m). The stomach.contents examined contained fish and insect remains.

Originally *C. gariepinus* was widespread in the lakes though it was more commonly found in the inshore waters with muddy bottoms and also near marginal water lillies and papyrus swamps. The distribution of this species has therefore also changed.

Protopterus aethiopicus

A few very large specimens of *P. aethiopicus* were encountered in open waters. These had probably outgrown the predation range of Nile perch. Juvenile specimens were commonly caught inshore near papyrus and water hyacinth mats. These areas are known to have low oxygen concentrations which dont favour the Nile perch.

Only two stomachs this species were analysed for stomach contents. Thay contained remains of mollscs.

Schilbe intermedius

Only one specimen of S. *intermedius* was obtained from Lake Kyoga near the river. The rest were obtained from Lake Nabugabo mainly from the southern part of the lake close to submerged aquatic macrophytes. This species was formerly oligobathic. The 230 stomachs analysed contained a variety of insects, predominantly chironomids, *Povilla,* chaoborids, and terrestrial insects. Only 7 stomachs contained fish remains.

The food of S. *intermedius* now consists of mainly invertebrates while fish are of less importance in its diet. The feeding habit of this species has therefore been modified.

Hormyrus kannume

Specimens of *H. kannume* were obtained from the rocky areas in Napoleon Gulf and Bugaia. No specimen were recovered from offshore trawling. This species used to be widespread in the lakes. Its distribution has now changed.

The 7 stomachs analysed contained mainly insects (chironomids & Ephemeroptera), *Caridina* and ostracods. The food is therefore similar to that on which it fed before.

Brycinus jacksonii

Specimens of *B. jacksonii* were obtained from all lakes sampled except Lake Kayanja. In these lakes, the species was widely distributed in the shallow pelagic zone, occassionally being caught together with shoals of *Rastrineobola,* another pelagic species. Most specimen were caught in nets set just off the shore line (about SOm), and very rarely in nets set next to the fringing vegetation or rock. Catches begin to appear in the nets starting from about five O'clock in the evening indicating that these fishes move towards the shore in the evenings, possibly to feed. *B. jacksonii* may be getting some protection from *Rastrineobola* by shoaling with it.

885 stomachs of fishes from Lake Nabugabo were examined for food. These contained mainly insect larvae and plants. A few had fish remains. 3 out of 22 stomachs from Bugaia contained fish fry

in addition to insects. *B. jacksonii* now feeds mainly on insects and rarely on fish prey though the latter, especially the haplochromines, used to be its preferred prey. This is because of their depletion by the Nile perch.

Discussion

The distribution and food of some surviving species are given in Tables 1 and 2, Most of the species that have survived are those species which used to feed on a wide variety of food items and whose areas of distribution included habitats which provided refuge from predation by the Nile perch. Such habitats included inshore areas, rocky out crops and swamps areas which have low oxygen concentration where Nile perch cannot survive.

When the Nile perch became established in the lakes it preyed upon the native species especially the haplochromines. At this point, it was in direct competition with the native predators such as *B. docmac* and *S. intermedius* for the fish prey. As the haplochromines declined the Nile perch began to prey upon other native fish species especially the small sized species and the juveniles of the larger ones such as *Bagrus.* This caused a decline in their populations. Most of the smaller species as well as the juveniles of the larger ones now restrict their activities to the vicinity of various refugia in order to escape predation by the Nile perch. Living in the restricted conditions within the refugia requires the ability to utilise the available food, mainly insects and other invertebrates, or living in waters with low oxygen concentrations such as papyrus and water hyacinth mats. Thus only the species with these abilities have been able to survive Nile perch predation and competition. Most of them have sought shelter in structural refugia (rocky outcrops and marginal macrophytes) and papyrus swamps. Since these refugia occur within their former ranges of distribution, they did not need to acquire altogether new adaptations to deal with the conditions. All they needed was a slight modification of their behaviours.

Since the populations of the surviving native fishes are now small and restricted they have become very vulnerable to harmful fishing methods. A fishing method, known as 'SEKE SEKE,' has now evolved in Lake Victoria in which fishermen dive down into these refuge areas and drive the fish out before rounding them up with nets. Unless some of these refugia are protected from fishermen, the surviving native species may eventually be wiped out of the lakes.

References

Achieng A.P. (1990): The impact of the introduction of Nile perch, Lates niloticus (L) on the fisheries of Lake Victoria

Beverton, R.T.H. (1959): Report on the state of the Lake Victoria fisheries. Fish Lab., Lowestoft (Mimeo).

Fish stocks and Fisheries in Lake Victoria. A handbook to the HEST/DANIDA regional seminar, Mwanza, Jan/Feb., 1989.

Fryer, G. (1960): Concerning the proposed introduction of Nile perch into Lake Vict0r.ia. E. AEr. Agric. J. 25 (4): 267-270.

Graham M. (1929): The Victoria Nyanza and its Fisheries. A report

on the fishing survey of·Lake Victoria, 1927-28, Lond: Crown agents for the Colonies.
Greenwood P.H. (1960): The fishes of Uganda. Ug. Soc. Kampala, 1966.
Okedi J. (1970): Further observations on the ecology of Nile perch" (L. niloticus Linn.) in Lake Victoria and Kyoga. Ann. Rep. E. Afr. Freshwat. Fish. Res. Org. P. 42-45.
U.F.F.R.O. *Occ.* Pap. No. 15, 1988.

Table 1. A comparison of the current and previous distribution of non-cichlids species in Lakes Victoria, Kyoga and Nabugabo

Species	Previous Distribution	Current distribution
P. aethiopicus	Widely distributed in shallo tar with muddy and sundy bottom	R--tricted to deep waters & shallow water with rocky outcrops; juveniles and sub-adults found near papyrus & water hyacinth mats
G. longibarbis	Marginal macrophytes	Swampy lake
M. victoriae	Marginal macrophytes	Swampy lak_
M. kannume	Widespread in both coastal and inshore waters	Restricted to marginal macrophyte,submerged rocks & rocky outcrops
B. jacksonii	Shallow inshore areas with aquatic vegetation	Inshore areas of lak— Victoria & Kyoga; all over Lake Nabugabo but esp. near aquatic vegn. & among 'Omena' shoals
B. altianalis	Widely distributed in shalow areas of the lak—	Mainly occuring in rivers, but also near papyrus fringes and hyacinth mats of L. Kyoga
B. kerstenii	Coastal areas of lakes and rivers	Swampy lake (Manywa)
B. docmac	Wide	Rocky areas and rivers
S. *intermadius*	Wide	Near macrophyt——reas in the lakes; in rivers
C. gariepinus	Wide but mainly in -hallo tar with muddy bottom; marginal macrophyt——r—s; flood plains	r--tricted to papyru_ swaps, hyacith mats & other marginal macrophytes; at bottom in d--p waters of lake Victoria
S. *afrofischeri*	Shallow areas ••p. ·_ar marginal vegetation	mainly inshore ar — with muddy bottom or vegetation and rocky bottoms
C. muriei	Marginal swamps, temporary streams, & in rivers among ston--	Same
A. frenatus	Marginal swamps, temporary streams & in rivers among stones	Same

Table 2. A comparison of previous and current food of some of the extant species

Species	Previous food	Current food
B. altianalis	Omnivorous: fed on insects, phytoplankton, molluscs, higher plant material	**Same**
S. afrofischeri	insect larvae, molluscs	Insect larvae, higher plant matter, annelids, fish & molluscs
B. docmac	Fish (mainly Haplochromis), *Caridina* & insects	Fish (mainly *Rastrineobola)*, insects & molluscs; *Caridina* rarely eaten
C. *gariepinus*	Catholic: (mainly Haplochromis), insect larvae, molluscs, plants & plankton	Mainly insects; occasionally fish, haplochomines are now very rare.
S. intermedius	Fish (mainly Haplochromis & *Rastrineobola)*, insects	Mainly insects, occasionally plants, rarely fish
M. kannume	Insects	Insects, Caridina, Ostracods
B. jacksonii	Insects, fish, plants, molluscs	Insects, plants; rarely fish